987,265

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

A Pump and Electric Motor Unit for Pumping Liquids

We, SIGMUND PUMPS LIMITED, a British Company of Team Valley, Gateshead, 11, County Durham, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a pump and electric motor unit for pumping liquids which may be used, for example, to boost or effect water circulation in domestic or other hot water or space heating systems.

It is an object of the present invention to provide such a pump and electric motor unit of a simplified and economical construction.

According to the invention there is provided a pump and electric motor unit for pumping liquids and having a pump impeller, a motor stator and a motor rotor, and in which the pump impeller and a rotor body providing a mounting for the rotor laminations are formed integrally with one another and of synthetic plastics material.

In pump and motor units of the kind with which the invention is concerned, the rotor and its bearings are normally bathed in the liquid being pumped to provide cooling and lubrication, and the rotor body of the pump according to the invention may easily be so formed as to cover those parts of the rotor laminations normally exposed to the liquid being pumped. The laminations can thus be protected from corrosive liquids.

The rotor body may be moulded on a bearing member or members for the rotor so that the pump impeller, rotor body, rotor laminations, and rotor bearing member or members then form a single rotor-impeller structure. This construction makes for easy assembly and disassembly of the pump and motor unit.

The embodiments of a pump and electric motor unit according to the invention will now be described by way of example with reference to the accompanying drawings, in which:—

[*Price 4s. 6d.*]

Fig. 1 is a longitudinal cross-section through a pump and electric motor unit according to the invention; and

Fig. 2 is a cross-section through an alternative form of pump impeller and rotor body according to the invention.

The pump and electric motor units to be described have identical housings and motor stators and differ only in the detailed construction of their rotor-impeller structures.

Referring to Fig. 1, each of the pump and motor units comprises a cylindrical stator body 10 closed at one end 11 and made of a synthetic plastics material. An epoxy-based resin is a convenient material for the stator body 10 because of its high resistance to penetration by water. Within the stator body 10 are embedded the stator windings and laminations 12 of the electric motor.

Around the stator body 10 is formed a central integral circumferential annular rib 13 and a second narrower annular rib 14 is formed centrally on the rib 13.

Two circumferential grooves 15 and 16 are formed around the rib 13, one on each side of the rib 14 and rubber O-rings 17 and 18 respectively are accommodated in each of the grooves.

An approximately barrel-shaped metal housing 21 for the unit is formed in two approximately similar halves, each comprising a cylindrical end portion and a main portion tapering to an end face formed with a central aperture 22 and 23 respectively. The cylindrical portions of the two halves of the housing are engaged on the annular rib 13 on the stator body on opposite sides of the rib 14. The rubber O-rings 17 and 18 form seals between the two halves of the housing 21 and the stator body. The two halves of the housing are retained in position on the annular rib 13 by a metal ring 24 formed with inwardly directed edge flanges. The ring 24 is located on the annular rib 14 and its flanges engage outwardly directed flanges on the cylindrical

end portions of the two halves of the housing 21 and hold these outwardly directed flanges against the annular rib 14.

To facilitate assembly and disassembly of the unit, the ring 24 is broken at one point around its circumference and a socket to receive one leg of a U-shaped joining member 25 is formed on each of the two ends of the ring 24 so formed. The electrical leads to the motor stator 12 enter the stator body 10 through a member 26 of synthetic plastics material secured to the stator body and around which the legs of the U-shaped joining member 25 for the ends of the ring 24 are located.

Apertures 27 extending axially of the pump and motor unit and formed in the annular rib 13 complete a passage for flow of liquid from the aperture 22 at one end of one half of the unit housing along the space between that half of the housing and the stator body 10, through the apertures 27 in the rib 13, through the space between the other half of the housing and the stator body 10 to the aperture 23 in the end face of that other half of the housing.

The rotor-impeller structure of each pump and motor unit (generally indicated at 28) is mounted on a stainless steel stub axle 29 one end of which is mounted in a hollow boss 32 formed centrally in the closed end 11 of the stator body 10. The stub axle 29 extends into the stator body 10 axially thereof.

At its free end, the stub axle 29 is formed with an integral flange 33 which constitutes a thrust bearing for one end of the rotor-impeller structure 28. The end of the axle mounted in the stator body is of reduced diameter and between the shoulder thus formed on the axle and the inner end of the hollow boss 32 on the stator body, there is located on the axle 29 a stainless steel washer 34 which constitutes a second thrust bearing for the other end of the rotor-impeller structure 28. The axle 29 is secured by a nut 35 engaged on a screw-thread formed on the extreme end part of the axle which projects from the outer end of the hollow boss 32.

The rotor-impeller structure 28 includes a cylindrical rotor body 36 of synthetic plastics material, such as an epoxy resin or an acetal resin. The rotor body 36 is formed in one piece with a connecting member 37 which is constituted by a cylinder of larger diameter than the rotor body 36 and in one piece with a centrifugal pump impeller 38 located at the end of the connecting member 37 remote from the rotor body 36.

The rotor body 36 is formed with a shallow circumferential groove 39 in which is located the inner portion of the annular rotor laminations 42.

At each end of the cylindrical rotor body 36 and extending axially inwardly nearly to the centre thereof, is located a separate cylindrical bearing 43, 44 for the rotor-impeller unit 28 made, in this case, of graphite. Each of the two graphite bearings 43 and 44 has an end flange located outside the rotor body 36.

The bearings 43 and 44 are engaged on the steel stub axle 29 between the thrust bearings 33 and 34 on the axle and the flanges of the graphite bearings are engaged with the thrust bearings. The rotor body 36 and connecting member 37 extend away from the closed end 11 of the stator body 10 and the pump impeller 38 is located between the annular face of the stator body 10 surrounding its open end and the adjacent end face of the housing 21 of the pump and motor unit.

The present unit has the advantage that a layer of synthetic plastics insulating material is located between the motor rotor 42 and the steel axle 29. This has the effect of reducing electrical losses due to eddy currents in the axle.

In operation, liquid drawn into the eye of the pump impeller 38 through the aperture 22 in the adjacent end face of the housing 21 is urged to the periphery of the impeller and passes axially of the pump and motor unit along the space between the housing and the stator body and through the apertures 27 in the first annular rib 13 on the stator body to the aperture 23 in the other end face of the housing 21 and out of the pump and motor unit.

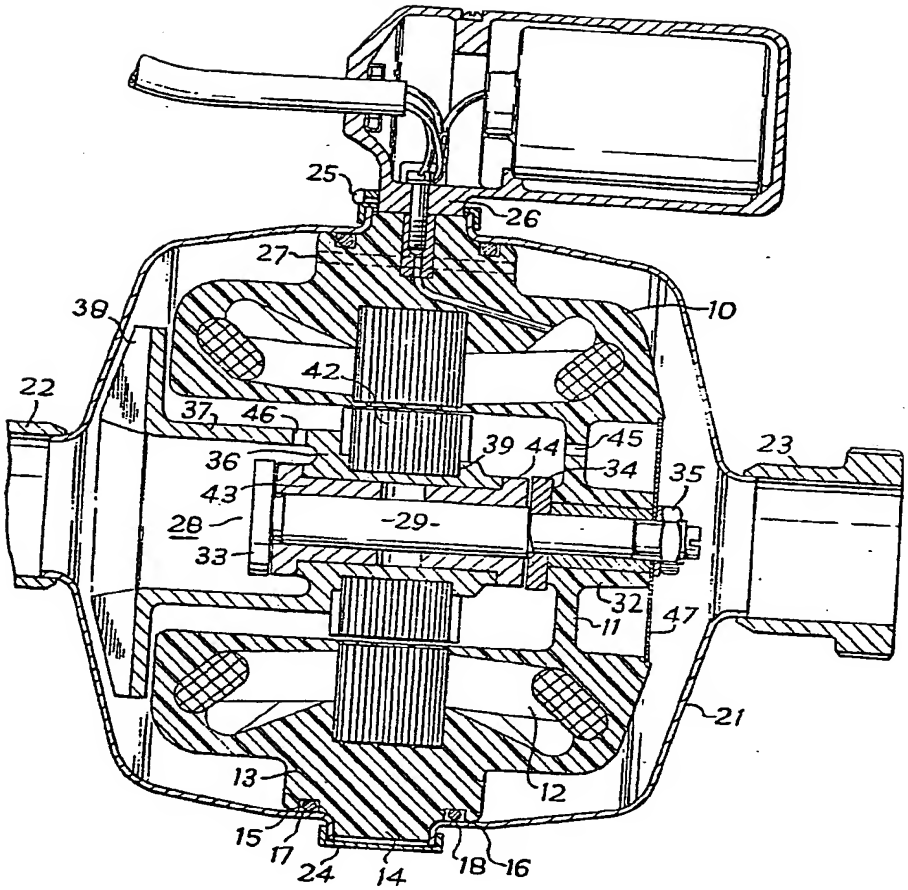
A hole 45 in the closed end of the stator body and a hole 46 in the connecting member 37 of the rotor-impeller unit 28 enable liquid being pumped to recirculate through the stator body 10 to the eye of the impeller 38 to provide cooling and lubrication. A filter 47 is secured on the closed end 11 of the stator body 10 so that recirculating liquid must pass through it.

In the embodiment shown in Fig. 2, a rotor-impeller structure 50 comprises a cylindrical rotor body 51 of synthetic plastics material having inwardly extending end flanges 52 and 53, the inner peripheries of which are in liquid-tight engagement with the outer periphery of a cylindrical bearing member 54 made, in this case, of graphite. The rotor laminations 55 are located within the annular space between the end flanges 52 and 53 of the cylindrical rotor body and are thus completely enclosed by the rotor body 51 and the bearing member 54.

A cylindrical connecting member 56 in one piece with the rotor body 51 extends from the outer face of the end flange 52 of the rotor body 51 and a centrifugal pump impeller 57 is located on the end of the connecting member 56 remote from the rotor body 51 and is in one piece with the connecting member 56 and rotor body 51.

The bearing member 54 is formed with a central inner annular groove 58 which divides

Fig .1.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987265 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

Fig. 1.

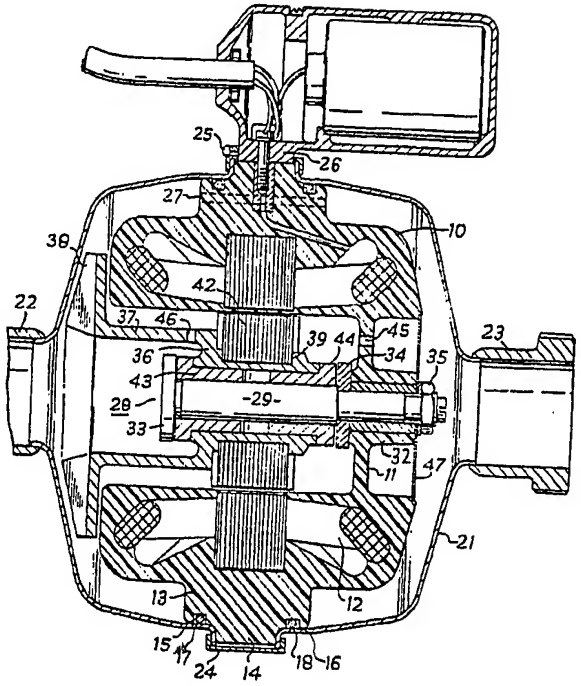

Fig. 2.